

THAT WHICH IS CLAIMED:

1. An isolated nucleic acid molecule comprising a nucleotide sequence  
5 selected from the group consisting of:
- (a) a nucleotide sequence encoding a maize 3-oxoacyl-[ACP] reductase (OAR);
  - (b) a nucleotide sequence encoding a soybean OAR;
  - (c) a nucleotide sequence comprising the nucleotide sequence set forth  
10 in SEQ ID NO: 1, 3, 5, or 7;
  - (d) a nucleotide sequence which encodes a polypeptide having the amino acid sequence set forth in SEQ ID NO: 2, 4, 6, or 8;
  - (e) a nucleotide sequence comprising at least 15 contiguous bases of at  
15 least one nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity;
  - (f) a nucleotide sequence having at least 85% sequence identity to at  
20 least one nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity;
  - (g) a nucleotide sequence comprising at least 20 nucleotides in length  
25 which hybridizes under low stringency conditions to at least one nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity; and
  - (h) a nucleotide sequence complementary to a nucleotide sequence of  
30 (a), (b), (c), (d), (e), (f), or (g), wherein said nucleotide sequence is capable of antisense suppression of OAR expression in a cell.

2. An expression cassette comprising at least one nucleic acid molecule of claim 1 operably linked to a promoter.

5 3. The expression cassette of claim 2, wherein said promoter drives expression in a plant cell.

4. The expression cassette of claim 2, wherein said nucleic acid molecule is operably linked in an antisense orientation to said promoter.

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5. The expression cassette of claim 3 further comprising a peroxisome-targeting signal operably linked to said nucleic acid molecule.

6. A non-human host cell transformed with at least one expression cassette of claim 2.

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7. The host cell of claim 6, wherein said host cell is selected from the group consisting of a plant cell, a bacterial cell, and a yeast cell.

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8. A transgenic plant comprising in its genome a stably integrated first nucleotide construct comprising a nucleic acid molecule operably linked to a first promoter that drives expression in a plant cell, wherein said nucleic acid molecule comprises a first nucleotide sequence selected from the group consisting of:

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- (a) a nucleotide sequence encoding a maize OAR;
- (b) a nucleotide sequence encoding a soybean OAR;
- (c) a nucleotide sequence comprising the nucleotide sequence set forth in SEQ ID NO: 1, 3, 5, or 7;
- (d) a nucleotide sequence which encodes a polypeptide having the amino acid sequence set forth in SEQ ID NO: 2, 4, 6, or 8;
- (e) a nucleotide sequence comprising at least 15 contiguous bases of at least one nucleotide sequence selected from the group consisting of

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the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity;

(f) a nucleotide sequence having at least 85% sequence identity to at least one nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity;

(g) a nucleotide sequence comprising at least 20 nucleotides in length which hybridizes under low stringency conditions to at least one nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO: 1, 3, 5, and 7, wherein said nucleotide sequence encodes a polypeptide comprising OAR activity; and

(h) a nucleotide sequence complementary to a nucleotide sequence of (a), (b), (c), (d), (e), (f), or (g), wherein said nucleotide sequence is capable of antisense suppression of OAR expression in a cell.

9. The plant of claim 8, wherein said plant is a monocot or a dicot.

10. The plant of claim 9, wherein said plant is selected from the group consisting of corn, soybean, wheat, rice, alfalfa, barley, millet, sunflower, sorghum, safflower, *Brassica spp.*, and cotton.

11. Transformed seed of the plant of claim 8.

12. The plant of claim 8 further comprising in its genome a stably integrated second nucleotide construct comprising a second promoter that drives expression in a plant cell operably linked to a second nucleotide sequence, wherein said second nucleotide sequence encodes a polyhydroxyalkanoate (PHA) synthase

13. The plant of claim 12, wherein said PHA synthase is encoded by a nucleotide sequence selected from the group consisting of:

- (a) a nucleotide sequence encoding a bacterial PHA synthase; and
- (b) a nucleotide sequence selected from the group consisting of the nucleotide sequences set forth in SEQ ID NO:9, SEQ ID NO:10, GenBank Accession No. M58445, GenBank Accession No. AF042276, EMBL Accession No. A49465, EMBL Accession No. X66592, and DDBJ Accession No. D88825.

14. The plant of claim 13, wherein said PHA synthase is capable of utilizing C<sub>4</sub>-C<sub>18</sub> as substrate.

15. The plant of claim 13, wherein said substrate is D-3-hydroxyacyl-CoA.

16. The plant of claim 13, further comprising in its genome a stably integrated third nucleotide construct comprising a third promoter that drives expression in a plant cell operably linked to a third nucleotide sequence, wherein said third nucleotide sequence encodes a PHA synthase capable of synthesizing polyhydroxybutyrate.

17. The plant of claim 16, wherein said third nucleotide sequence comprises a nucleotide sequence selected from the group consisting of:

- (a) a nucleotide sequence set forth in GenBank Accession No. J05003;
- (b) a nucleotide sequence set forth in GenBank Accession No. U04848;
- (c) a nucleotide sequence set forth in GenBank Accession No. AF078795;
- (d) a nucleotide sequence set forth in EMBL Accession No. AJ006237;
- (e) a nucleotide sequence set forth in DDBJ Accession No. AB009237;

- (g) a nucleotide sequence set forth in GenBank Accession No. L07893;
- (h) a nucleotide sequence set forth in DDBJ Accession No. D43764; and
- 5 (i) a nucleotide sequence set forth in GenBank Accession No. U66242.

18. The plant of claim 16, wherein at least one of said first, second, and third nucleotide sequences is operably linked to a nucleotide sequence encoding a peroxisome-targeting signal.

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19. The plant of claim 16, wherein at least one of said first, second, and third promoters is selected from the group consisting of seed-preferred promoters, chemical-regulatable promoters, germination-preferred promoters, and leaf-preferred promoters.

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20. The plant of claim 16, wherein said plant produces PHA in at least one cellular compartment in seeds selected from the group consisting of the cytosol, the plastids, and the peroxisomes

- 20 21. A method for producing PHA copolymers in a plant, comprising:
- (a) providing a plant of claim 16;
  - (b) growing said plant under conditions favorable for the synthesis of said PHA copolymers in said plant;
  - (c) allowing sufficient time for said plant to produce said PHA copolymers;
  - (d) harvesting said plant or part thereof containing said PHA copolymers; and
  - (e) extracting said PHA copolymers from said plant or part thereof.
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- 30 22. An isolated polypeptide comprising a member selected from the group consisting of:

- (a) a maize OAR;
- (b) a soybean OAR;
- (c) a polypeptide comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, or 8;
- 5 (d) a polypeptide comprising at least 15 contiguous amino acids of at least one amino acid sequence selected from the group consisting of the amino acid sequences set forth in SEQ ID NOs: 2, 4, 6, and 8, wherein said polypeptide comprises OAR activity;
- 10 (e) a polypeptide having greater than 85% sequence identity to at least one amino acid sequence selected from the group consisting of the amino acid sequences set forth in SEQ ID NOs: 2, 4, 6, and 8, wherein said polypeptide comprises OAR activity; and
- 15 (f) a polypeptide encoded by the nucleotide sequence set forth in SEQ ID NO: 1, 3, 5, or 7.